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ABSTRACT

This is one in a series of reports to the President and Congress developed by the President's Information Technology Advisory Committee (PITAC) on key contemporary issues in information technology. This report highlights findings and recommendations on how the government can provide leadership by solving key information technology challenges, improving public access to Federal resources, and re-engineering and simplifying internal and external government transactions. Three findings are identified that focus on: technological barriers to citizen access; information technology for organizational efficiency; and structural impediments for Federal CIOs. The report offers three key recommendations: establish a coordinated research program that addresses Federal e-government requirements; create an Office of Management and Budget (OMB) Office for Electronic Government and a Government Information Technology Innovation Program to promote, lead, and coordinate Federal efforts to improve citizens' access to government information and improve government processes; and establish pilot projects focused on connecting near-, mid-, and long-term Federal efforts. (AEF)

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ED 462 970

REPORT TO THE PRESIDENT

EXECUTIVE OFFICE OF THE PRESIDENT OF THE UNITED STATES
PRESIDENT'S INFORMATION TECHNOLOGY ADVISORY COMMITTEE

Transforming Access to Government Through Information Technology

IR021130

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President's Information Technology Advisory Committee

Panel on Transforming Government

September 2000

REPORT TO THE PRESIDENT

Transforming Access To Government Through Information Technology

PRESIDENT'S INFORMATION TECHNOLOGY ADVISORY COMMITTEE

Panel on Transforming Government

September 2000

President's Information Technology Advisory Committee

August 31, 2000

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The Honorable William J. Clinton
President of the United States
The White House
Washington, DC 20500

Dear Mr. President:

The President's Information Technology Advisory Committee (PITAC) took special note of your December 1999 executive memorandum promoting electronic government, as well as recent announcements such as the launch of the FirstGov website for one-stop access to government information and services. We share your vision to create an "Information Age" government made more efficient, effective, and accessible through information technology. In fact, our 1999 report, *Information Technology Research: Investing in Our Future*, identified the relationship between government and citizens as one of the vital areas of our national life where information technology offers the potential to dramatically transform current practices in ways that will greatly benefit all Americans.

Thus, we are pleased to enclose *Transforming Access To Government Through Information Technology,* the first in a series of follow-ups to our 1999 report. This latest report highlights our findings and recommendations on how the government can provide leadership by solving key IT technology challenges, improving public access to Federal resources as well as re-engineering and simplifying internal and external governmental transactions. Our goal is to define a program that will provide our citizens with full and easy electronic access to their government regardless of their physical location, level of computer literacy or physical abilities.

The report offers three key recommendations. First, we recommend that the Federal government, as the world's largest developer of, customer for, and user of information technology, assume a leadership role in transforming government through the enhanced use of information technology. The Federal government must define a coordinated and aggressive IT research program which addresses long-term technology challenges, including computer security and privacy, scalable information infrastructures, and standards for data sharing and integration. Second, the Committee recommends that an Office for Electronic Government be established within the Office of Management and Budget. The mission of this new office would be to promote innovative IT efforts and policies across the Federal government. A companion Government IT Innovation Program (GITIP)

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should also be created to identify and fund high-risk, exploratory, and experimental IT projects. Lastly, to bridge the gap between research and operational systems, the PITAC recommends establishing pilot projects and Emerging Technology Centers (ETCs) to encourage and promote information integration across the Federal government and address the most immediate IT roadblocks.

We believe that adopting these recommendations will allow our nation to make significant strides towards realizing our shared vision. The Committee looks forward to working with you and the Congress to empower American citizens by providing them with access to their government through information technology. Thank you for the continuing opportunity to advise you on these and other important issues.

Sincerely,

Raj Reddy, Ph.D.
PITAC, Co-Chair

Irving Wladawsky-Berger, Ph.D.
PITAC, Co-Chair

Attachment

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About This Report

"Transforming Access to Government Through Information Technology" is one in a series of reports to the President and Congress developed by the President's Information Technology Advisory Committee (PITAC) on key contemporary issues in information technology. These focused reports examine specific aspects of the near- and long-term research and development and policies we need to capture the potential of information technology to help grow our economy and to address many of the important problems facing the nation.

The 24-member PITAC, comprising corporate and academic leaders, was established by Executive Order of the President in 1997 and renewed for a two-year term in 1999. Its charge is to provide the Federal government with expert independent guidance on maintaining America's preeminence in high performance computing and communications, information technology, and Next Generation Internet R&D.

In February 1999, the PITAC issued an overview and analysis of the current state of Federal information technology research and development in a report entitled "Information Technology Research: Investing in Our Future." That report set forth a vision of how information technology can transform the way we live, learn, work, and play, with resulting benefits for all Americans. But the report warned that Federal information technology research and development is seriously inadequate, given its economic, strategic, and societal importance. The Committee concluded that the government is funding only a fraction of the research needed to maintain U.S. preeminence in information technology and propel the positive transformations it enables.

The Committee identified 10 information technology "National Challenge Transformations" — including the relationship between government and citizens — that are critical to America's future. To meet these transformation challenges, the PITAC recommended a strategic Federal initiative in long-term information technology R&D and outlined the research priorities that will drive the necessary advances in the new century.

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To examine some of the transforming applications of information technology in greater detail, the PITAC subsequently convened a group of panels led by Committee members and including invited outside participants with relevant expertise. Three panels focused on information technology national challenges: Transforming Government, Transforming Health Care, and Transforming Learning. The Committee also established several panels to report on critical technology issues that span the transformations, including Digital Divide Issues, Digital Libraries, International Issues, and Open Source Software for High End Computing. Over the past year, each of the panels has analyzed relevant research data and documents; held workshop discussions and conducted interviews with experts in their fields; and studied the fiscal, organizational, and economic implications of strategies to generate necessary information technology research and development advances in these key areas of our national life. The Committee plans to convene additional panels in the months ahead.

"Transforming Access to Government Through Information Technology" and the succeeding reports in this series present targeted findings and recommendations to the President and Congress designed to help the nation realize the vision of these positive transformations. Their benefits for our future can be extraordinary, but they are not guaranteed. To make the vision a reality, we need the results of aggressive, well-funded, and well-managed Federal research programs.

Acknowledgements

The Panel on Transforming Government appreciates the advice and assistance of William Scherlis, Carnegie-Mellon University, who provided thoughtful and constructive reviews of drafts of this report. The Panel thanks the numerous Federal employees who provided information, including Larry Brandt, Program Director for Digital Government at the National Science Foundation, the Chief Information Officers Council and staff, and the managers who briefed us. We also thank Tom Kalil, National Economic Council, Lori Perine, Office of Science and Technology Policy, and Jasmeet Seehra, Office of Management and Budget, for their assistance in uncovering the issues and exploring potential solutions.

The Panel would also like to acknowledge the work of the National Coordination Office for Computing, Information, and Communications in supporting its efforts to produce this report. The Panel thanks Robert Winner, who kept the Panel on track and organized our ideas and analyses into the final prose. We thank Yolanda Comedy, Sally Howe, Laurie Mitchell, and Kay Howell for supporting the Panel's deliberations, for their review of earlier drafts of this report, and for their helpful comments. We thank Martha Matzke, who edited and formatted the final document. And finally, we are grateful to the entire staff at the National Coordination Office. Our meetings went smoothly because of their careful preparation.

A Vision of Government Access Transformed

Government services and information are easily accessible to citizens, regardless of their physical location, level of computer literacy, or physical capacity. Intelligent systems guide citizens by providing a one-stop shopping experience for locating requested information. Documents and forms can be accessed, completed, and submitted electronically. Automated business processes allow nearly instantaneous response to citizens' requests. In times of natural emergencies, emergency crews have instant access to three-dimensional building models, risk analysis and assessment, high-resolution local weather predictions, stress analyses of damaged structures, rapid evacuation planning tools, and emergency agency coordination.

PITAC Report, February 1999

Introduction

In "Information Technology Research: Investing in Our Future," its 1999 report to the President, the President's Information Technology Advisory Committee articulated a vision of the ways information technology will drive progress in the 21st century. The Committee identified 10 vital areas of our national life — including the relationship between government and citizens — in which information technology offers the potential to dramatically transform current practices in ways that will greatly benefit all citizens. The report described the promise of the future in these key areas and outlined the technical challenges that must be overcome to realize the highly desirable societal transformations enabled by information technology and to reap the resulting public benefits.

As a follow-up to its report, the PITAC established a group of panels to examine the transformation challenges in greater depth and make recommendations for addressing them to the President and Congress. This document details the findings and recommendations of the Panel on Transforming Government, co-chaired by PITAC members David M. Cooper and Robert H. Ewald.

Overview

The perspective of the Transforming Government Panel is shaped by a fundamental reality: The Federal government is the world's largest and most complex developer of, customer for, and user of information technology. Even individual departments and agencies rank among the world's largest information technology users. In that context, the PITAC charged the Panel with identifying the key technical challenges and developing a long-range technology-based strategy to harness the power of advanced information systems to make government's stores of information and vital services easily accessible to and usable by all U.S. citizens "regardless of their physical location, level of computer literacy, or physical capacity." The nation clearly should seek this goal, but current technology is inadequate and difficult problems must be overcome.

The PITAC report summarized the technical challenges and potential benefits to society as follows:

Realizing the Vision: Technical Challenges and Benefits

There is a huge potential to make all government institutions both more efficient and more responsive through information technologies. Technical challenges include significant improvements in systems and methods for accessing data, including high performance data storage and tools to locate and present information. Robust, reliable, and secure networks and software to deliver and protect critical information are important research topics. It is imperative that improvements in government be available to all citizens, so we must understand and surmount barriers to access.

To conduct its study of the challenges, the Transforming Government Panel met with several key Federal CIOs and other representatives, attended symposia, and reviewed strategic planning documents and reports of previous studies. The Panel considered only civilian applications in the Federal administration; it did not consider Department of Defense applications or those of other national security entities, the Congress, the courts, or state and local governments. In many cases, the needed technologies will be the same across all these application levels, but in the national security areas there are unusual requirements. The Panel determined early in its deliberations that the substantial and distinct national security and DoD issues warrant separate PITAC studies. The Panel urges PITAC to initiate a panel focusing generally on national security applications of information technology and specifically on those of the DoD.

The Transforming Government Panel agrees with the PITAC report's finding that great opportunities exist to improve public access to Federal information resources and to simplify transactions between the government and citizens and within the government itself. The research and pilot projects the Panel proposes below have the dual benefits of addressing government issues and attracting additional, sorely needed workers to exciting projects. The following findings and recommendations are intended to assist the President and Congress to seize the opportunities and achieve the benefits.

Findings

Finding 1. Major technological barriers prevent citizens from easily accessing government information resources that are vital to their well being. Today government information is often unavailable, inadequate, out of date, and needlessly complicated.

The PITAC considered two forms of public access: convenient, easy-to-use access to well-managed information and convenient, easy-to-execute transactions. The government stores large amounts of important

information. However, finding that information in the government's many databases is difficult, and correlating the meaning of findings from a number of inconsistently defined databases requires deep knowledge of the existence, contents, and management schemes of those databases. Similarly, well-defined transactions often require several sub-transactions with disparate agencies. These separate transactions are often unlinked, requiring expert knowledge of a variety of agency locations, procedures, rules, and requirements.

Some progress can and should be made using technology in its current state, but many end goals require substantial technological advances. For example, large-scale data integration across multiple independent databases is a significant research area. The PITAC concludes that progress can best be made through a continuum of near-, mid-, and long-term efforts — all carried out concurrently — under the guidance and, in some cases, control of strong coordinating mechanisms.

Finding 2. **Information technology can be used to increase organizational efficiency and effectiveness and save costs.**

While the PITAC focused on issues surrounding the interactions between government and the public, the Committee remained mindful of the use of information technology in internal government processes. Information technology can increase the efficiency and effectiveness of organizations of all sizes. Industry has amply demonstrated over the last 20 years that information technology can be used — in combination with careful process redesign — as both a forcing function and an implementation tool to increase process and product efficiency and improve effectiveness.

With some exceptions, the government has been slower than industry to take advantage of information technology's promise for several reasons. Among these are the scale of the Federal enterprise, the lack of incentives (or the existence of powerful disincentives) to cut costs, the curtailment of capital investments, the cumbersome Federal acquisition process, the risk-averse nature of government management, and conflicting and complex legal requirements for both openness and privacy. In addition, the government faces a decreasing supply of

competent, up-to-date information technology workers to conceive, implement, field, and manage new systems.

Finding 3. The Federal CIO Council understands information technology's utility for improving government services and processes, and the Council's strategy establishes appropriate and ambitious goals. But the CIOs' mandates require them to focus primarily on near-term operational issues and acquisitions. Budget planning processes make it difficult to carry out effective cross-agency coordination and execution and the long-term research efforts that many of the goals require.

The Federal CIO Council and many agencies have set appropriate, ambitious goals for improvement of government functions through the use of information technologies. Achieving these goals will enable cross-agency transactions and integration of information across agencies and departments — in essence, "one-stop shopping" for our nation's citizens. Industry has shown that large-scale solutions that cross many departments have to be able to evolve and have to be based on uniform user interfaces that result from strong cooperation among departments. Even to approach the desired result will require substantial cross-agency planning and execution. Unfortunately, the current budget planning process does not encourage such cross-agency activities.

While the CIO Council has established mechanisms for sharing results and lessons, the process of creating standardized processes and information representations, eventually leading to cross-agency transactions and information federation and integration, is much harder and requires cross-agency budget planning and execution. Creating cross-agency budgets requires substantial work and, therefore, is used only for large initiatives. Depending on cross-agency plans is very risky because of the uncertainty that all participants will receive adequate funding. Therefore, cross-agency projects and initiatives currently have to be large enough to warrant the effort but partitionable enough that no one really must depend on anyone else's appropriations or performance. In addition, stovepiping of both congressional and executive review processes causes stovepiping of plans and programs.

The Government Performance Results Act (GPRA), for example, while valuable in requiring agencies to set goals against which they can be held accountable, tends to hinder agency interdependencies in plans and programs because no agency will create a GPRA objective that depends on budgeting and operational success in another agency.

The PITAC applauds recent e-government initiatives proposed by the Administration and Congress, such as the firstgov.gov portal and those being considered in the House and Senate. However, many envisioned systems and services depend on continued progress in information technology research in the areas listed below. Current program management models do not encourage R&D program managers to take sufficient risks in pursuit of long-term goals. At the same time, someone must be responsible for technology transfer from successful research efforts into operational systems, a process in which the government has traditionally been weak.

Recommendations

The PITAC recommends the following three actions:

- Establish a coordinated research program that addresses Federal e-government requirements;
- Create an OMB Office for Electronic Government and a Government Information Technology Innovation Program to promote, lead, and coordinate Federal efforts to improve citizens' access to government information and improve government processes; and
- Establish pilot projects focused on connecting near-, mid-, and long-term Federal efforts.

Recommendation 1. *The Research Program*

Establish and coordinate an information technology research program that addresses the Federal government's most critical requirements for long-term technology development.

Having reviewed a range of Federal applications provided by the CIO Council and the NSF Digital Government Program, the PITAC has concluded that there are critical, long-term technical issues that need to be addressed to make government services and information easily accessible to citizens. These are:

- ***Security and privacy*** — Federal systems often contain information that should be available to authorized parties but not to anyone else. As evidenced by recent security breaches, the technologies to accomplish both availability and protection are in their infancy. Approaches that work on a small scale rarely work when applied to large systems, and envisioned Federal systems will be among the largest in existence. Critical information technology infrastructure protection requires a focus on this area at a level that may dwarf current investments.

- ***Data integration*** — There are several technological issues here. First is how to present users a coherent view of information stored in radically varied ways on systems that were created and have been optimized for a variety of purposes and base technologies. Second is how to make this coherent view both easy to use for non-technicians and adaptable to the various purposes that users might have. Third is how to do all of this efficiently. Each of these capabilities requires research in information management, human factors, storage systems, middleware, and related technologies. Practical systems will have to be based on strategies that combine integration, federation, and evolvability, and the systems' development and operation will require cooperation among departments and agencies at a level that is unusual for the Federal government.

- ***Software development and quality*** — Software development is too difficult, risky, and costly, and it requires highly trained professionals who are in short supply. Yet many Federal missions depend on software development and quality and, therefore, stand to gain enormous advantages from improvements in software and the processes required to create, test, deploy, and use it. To be most useful for government, improved software should be:

- developable or purchasable with predictable behavior and performance
- maintainable at reasonable cost
- integrable, evolvable, extensible, and adaptable with reasonable effort
- fail-safe

This is a long-term, difficult problem. However, the software research areas described in the PITAC's February 1999 report are the ones the PITAC believes need to be central to the research effort for Federal purposes. Several of these, such as component technologies, require application-specific demonstration efforts, and it would be appropriate and useful for the government to pursue some of those.

- ***Scalable information infrastructure (SII)*** — High-volume interactions with citizens and within the government, especially those taking advantage of a wide range of media such as full-motion video, require advances in the capability and reliability of our information infrastructure. Just as the commercial world has found thousands of useful applications for the Internet, so are there many useful applications in government. The government has been at the center of ongoing Internet technology developments, and it is ideally situated to try experimental and production applications now, as new Internet technologies emerge. One goal should be to make the Internet so reliable that it can be depended upon for mission-critical applications.

  The SII manages information as well as communications. Unlike physical libraries, digital libraries manage information so as to provide a potentially infinite number of users with access to each item in the library simultaneously. Many large-scale government applications require access to the vast stores of government information best managed in digital libraries. Thus, the government needs to aggressively pursue the information management technologies needed for large-scale digital libraries. The PITAC Panel on Digital Libraries is actively pursuing this area and the Panel on Transforming Government has coordinated with that Panel on its forthcoming report.

The Next Generation Internet (NGI) is a fundamentally important, ongoing SII project required for many of the transformational efforts envisioned for the government. This important Federal initiative deserves full funding in all participating agencies, and many other agencies should build applications upon it.

- ***Development and availability of high end systems*** — There are important governmental requirements for advances in high end systems. The government must continue to pursue research and experimental development of these systems, software, and hardware components, including high performance, large-scale storage. Example applications include intelligence in law enforcement, weather modeling and forecasting, large-scale planning, large-scale information fusion in emergencies, geographic information systems, ecological modeling and science, and integrated product and process development. Fundamental government purposes are served through the widespread support of civilian science and engineering research, and advanced high end systems are required for this. While there are commercial applications for advanced high end systems, the Federal government remains the primary customer in a shrinking market niche.

- ***Socioeconomic implications of government uses of information technology*** — The government should launch studies to measure and understand the effects of new technologies on the relationship between government and citizens, including businesses. For example, studies of experiments in on-line voting need to be carried out to illuminate both technical and socio-political issues. Another important issue with political, sociological, and technical aspects is security and privacy. For example, there is an issue of what government databases should or should not be federated and how to "dither" information so that inferences about individuals cannot be drawn, while maintaining the validity of statistical inferences.

Recommendation 2. *The Office for Electronic Government and a Government Information Technology Innovation Program*

The Administration should establish an Office for Electronic Government (OEG) within OMB with responsibility for promoting innovative information technology efforts and policies that improve both citizen access to information and government efficiency and effectiveness. The OEG would (a) create incentives for, promote, facilitate, and provide matching funds for innovative projects and best practices with cross-agency implications and (b) advise the Director of OMB on funding of all e-government efforts within agencies. The Administration should establish an OEG Government Information Technology Innovation Program to fund high-impact, innovative, or exploratory cross-agency projects executed and managed in various agencies.

The PITAC recommends creation of an Office for Electronic Government (OEG) within OMB led by a senior-level Presidential appointee. The OEG is needed to champion the effective use of information technology and the Internet as the best means to rapidly improve the access of citizens and businesses to government data, the quality of their interactions with the Federal government, and the government's own business operations. The OEG's mission will be to promote innovative and cross-agency efforts that serve long-term needs or that are too experimental or risky to be undertaken within the usual Federal information technology acquisition process. This includes but is not limited to the Government Information Technology Innovation Program (GITIP). The OEG should also advise the Director of OMB concerning the funding of all e-government projects.

The OEG would be empowered to enable interagency information technology research and development projects, managed within the agencies, aimed at improving government functions. The Office should be empowered to create incentives for strong cooperation where required to develop standards and cross-agency systems, and GITIP should enable the OEG to organize and add funds to intra- and

interagency project and research budgets. The OEG should promote coordination and cooperation among agencies so as to establish process, interface, and information-representation standards as needed to reduce costs, increase effectiveness, and establish efficiencies across the Federal government. Because it helps establish interagency objectives at the OEG level, this approach addresses the finding that government objectives and reviews tend to be stovepiped, for example, within the GPRA process. Rather than having the decision-making authority and control of an "information technology czar," the OEG should have a service mandate that enables agency and cross-agency innovation through incentives and budget plus-ups.

The President and Congress should recognize and support the efforts of the CIO Council in implementing Federal information technology policies. The CIO Council's efforts so far are laudable, but the mechanism is not yet sufficient for the task at hand. Incentives and mechanisms for aggressive innovation are particularly insufficient. The current acquisition system drives CIOs to satisfy near-term operational requirements with minimum risk. Establishing the OEG and GITIP will provide CIOs with increased opportunity and means to undertake efforts that may not be appropriate for the normal acquisition process because of their innovative, experimental, long-term, or exploratory character, or because they involve multiple agencies. A coordinated management mechanism, led by the OEG and implemented by the Federal CIO Council with collaboration of the NSTC, would address this opportunity. Thus, the CIOs will have increased responsibility to innovate and to expand their planning horizons based on visibility into and influence over mid- and long-term efforts.

Congress should empower and fund the OEG with R&D funds at a level annually justified within the authorization and appropriations process to enable multiyear, cross-agency, and intra-agency projects. Based on our industrial experience, cost projections of several government projects, and experience with government-funded research efforts, the PITAC recommends a starting point of about $100 million per year. This would allow 10-20 projects with total annual budgets of $1-20 million, including matching funds proportioned in accordance with the level and nature of risks taken.

The Panel reviewed several current commercial Internet-based development efforts and discussed the issue of budget size with venture capitalists. Venture capitalists estimated that starting a new Web-based business costs about $50-100 million, provided that it does not require a substantial amount of new technology. The estimated $100 million-per-year funding line we recommend for GITIP would provide for prototypes, experiments, and risk management, not for acquisition of fieldable, production systems.

The governmentwide Y2K effort showed that centrally coordinated budget plus-ups and management can be effective when Congress is able to authorize funding based on knowledge of project plans and selection criteria. We recommend similar cooperation between the Administration and Congress to review and agree upon project plans, criteria, and funding levels sufficient for success.

Individual efforts within GITIP would be created as collaborations among client agencies (e.g., Agriculture, Census, EPA) and, where appropriate, technology contributors (e.g., DARPA, NSF, NIH, NASA, NOAA, and others). Program managers for the efforts would be drawn from a cadre of professional program managers selected either from CIO-led operational acquisition organizations that have suitable experience or from research agencies. Program managers would retain a primary affiliation with their home agencies.

The OEG, working in concert with the Federal CIO Council and the National Science and Technology Council, should be responsible for ensuring that results of long-term R&D efforts are appropriately exploited in advanced agency projects. The OEG should take advantage of the fact that some agencies — NASA and NOAA, for example — view themselves as particularly able to bridge from basic research to operational use.

In concert with and as an integral part of the establishment of the technology efforts recommended above and pilot projects below, the OEG should immediately establish an effort to measure improvements and disseminate best practices and lessons learned.

The person appointed to lead the OEG should bring to the job a combination of technical and operational vision, an understanding of

how to get things done in the government, and a strong understanding of information technology research, development, and operational issues and approaches. A small fraction of the $100 million budget would be required to operate a coordination office. As a point of clarification, the PITAC does not view the leader of the OEG as the senior person with oversight responsibility for Federal information technology research recommended in the February 1999 PITAC report.

Recommendation 3. *Bridging the Gap*

Establish pilot projects and Enabling Technology Centers (ETCs) to extend technology and transfer it into operational systems.

Pilot projects and ETCs should be budgeted and executed to increase the use and utility of information technology for Federal missions. Many useful mid- and long-term efforts are technically and operationally challenging. Any effort, for example, that requires the creation of a data model spanning multiple, currently independent government data sources will be technically difficult and may raise issues about polices and statutes that govern information sharing among agencies. We encourage multiple pilot experiments with information integration across many government sectors.

Pilot projects are useful for many reasons. They enable teams of application experts and computer scientists to work collaboratively on a relevant problem. They form bridges among near-, mid-, and long-term e-government plans and programs. They can incorporate software vendors, systems integrators, and others at the beginning, so that implementing teams will be positioned and expected to push the R&D products to operational production mode. Pilot projects provide non-R&D agencies access to the best information technology researchers and their facilities. They reinforce researchers' understanding of real world needs while providing practitioners with a greater vision of future possibilities. They assist in recruitment by exposing computer science students to very challenging problems that might attract them after graduation. Perhaps most important, pilot projects bootstrap the improvement process and prove to practitioners that revolutionary changes can actually work.

Three areas are recommended for highest priority:

- ***Crisis Management*** — A government Information Technology for Crises Management Team has already been established that has planned an ETC on this topic. The PITAC applauds this effort and encourages the Administration and Congress to establish an interagency budget for it.
- ***Access for Disabled Citizens*** — There is a substantial requirement for new technology here if the government is to satisfy currently articulated access policies.
- ***Extending firstgov.gov*** — This project currently envisions a Yahoo-like portal to government Web sites. It seeks to organize the portal along several lines, including popular sites and an exhaustive taxonomy. It does not provide for information integration or federation, nor does it require standardization among agencies. When taken only at this level, firstgov.gov is a near-term effort built with currently available technologies. But we encourage the OEG, recommended above, to promote and support useful, extended visions requiring more advanced technology. The OEG project should develop advanced capabilities to provide Internet-based access to government services, including transactions with government agencies, metadata representation in support of integration of information, and other advanced services. Firstgov.gov should focus efforts on government-specific capabilities such as transaction support, metadata creation, and comprehensive searchable catalogs of information and services.

Other areas recommended for implementation:

- ***Information Technology for Information Technology Training*** — This is potentially one part of the solution to the Federal information technology workforce shortage. The efficacy of computer-based training has been well documented. New techniques need to be developed to take advantage of the Internet for delivery, the Web as an organizing mechanism, and the increasing availability of inexpensive computing power to make systems adaptable to learners.

- ***Privacy, Confidentiality, Security, and Authenticity for Internet-based Government Interactions with the Public*** — Data integration of the types mentioned throughout this report requires increased attention to privacy, confidentiality, security, and authenticity. As the degree of integration increases, so does the likelihood of inadvertent disclosure of information obtained under a pledge of confidentiality. With heightened concern over electronic medical records, tax records, and other personal information documents, and the accumulation of large transaction databases by business enterprises, official data-collection agencies that depend on voluntary responses are even more concerned about ensuring the privacy and security of their respondents and the information they provide. Agencies need methods and resources to ensure that data are secure from outside tampering. (Would we know if someone went into a database of millions of numbers and changed just one?) Tackling these security issues requires near-, mid-, and long-term activities that can address both technical and political facets of the problem.

- ***Integrating Statistical Information*** — All levels of government produce and use statistical information, but integrating statistical information in ways that policymakers and researchers find useful is a very difficult problem. Issues ranging from deciding when and where to build a school, road, or business to investigating causes and potential remedies of air and water pollution often can be focused on relatively small geographical areas. Issues related to public health, occupational safety and health, Social Security, Medicare, etc., may be national in focus, but variations in policy implications for demographic or other sub-populations could differentially affect various state or local government policies. While there exist centers like the California Environmental Resources Evaluation System and the National Center for Geographic Information and Analysis, the first type of center is focused on providing data for one state and theme and the second on research methodologies for analyzing geographically based data. Research is needed on how to create the first type of site more easily across a variety of geographies and themes and

providing tools for analysis that a school principal, farmer, health care provider, business entrepreneur, or state office could use.

The pilot projects should be based on a strategy that pursues near-, mid-, and long-term issues, yielding a continual release of demonstration prototypes, an effective infusion of emerging technologies, and a continuous pursuit of solutions to long-term research issues.

To execute such a strategy, the agencies will need to establish partnerships among government, industry, and universities. Partnerships offer the potential benefit of creating a more efficient flow of new ideas into agencies that otherwise have not pursued long-term information technology research in support of their missions. One approach would be to cross-matrix application-based pilots with technology-based centers (or virtual centers) in a formal way. This formalization would have to be planned, contracted, and executed with the continuous involvement of the government participants.

It is important to maintain continuity between existing and longer-term efforts. Some efforts in and among various agencies have already started; some of these are large projects like the Next Generation Internet (NGI) and others such as the FedStats and firstgov.gov efforts are more modest. The PITAC encourages the government to select the most promising of these existing efforts, fully fund those that are currently underfunded — especially those involving multiple agencies — and build upon them with long-term objectives. As mentioned earlier, a serious effort is required to establish the connections among application-driven centers, near-term pilots, and technology-driven centers. This applies to existing projects as well.

Note on Federal Workforce Issues

Leading-edge information technology projects such as those recommended here can serve as important recruiting incentives to help Federal agencies attract highly qualified information technology workers.

The Federal CIO Council has identified the near-term problem that a large fraction of Federal information technology workers will become eligible to retire over the next few years. This demographic fact is amplified by an overall national information technology worker shortage. The government, industry, and universities are all competing for a too-small supply. The February 1999 PITAC report identified the need to increase academic involvement in exciting information technology research projects to help alleviate the national shortage of highly qualified information technology workers and increase the number of new graduates who might join the Federal workforce. In much the same way that exciting projects in academia will tend to expand the graduate student and faculty populations, Federal involvement in leading-edge projects has always caused technologists to gravitate to Federal projects, either as contractors or employees.

Government CIOs reported to the Panel that one of their most urgent needs is for people who can manage large-scale, information technology-intensive projects. This is a national problem in industry as well, and it is not clear that universities are able to meet the demand. The CIO Council has established an effort with several universities to address this shortage in the Federal context. The Panel did not review this effort, but its objective is clearly correct.

The CIO Council has planned several other projects on Federal information technology workforce training. While these efforts cannot solve the shortage by themselves, they can provide some relief by providing effective training tools for the existing workforce to upgrade skills. The PITAC Panel on Transforming Learning plans to report in Fall 2000 about uses of information technology in education and training. The Panel on Transforming Government has suggested to Learning Panel members that they consider recommending a pilot project that builds on the current CIO Council projects.

Note on National Security and DoD Issues

This Panel determined early in its study that national security and DoD issues should be considered separately by one or more new PITAC panels. The Panel sees two kinds of issues. First, there are national security applications. These include, among many other issues:, how the DoD should address high end computing as a critical — but potentially disappearing — national security technology; the importance of long-term, advanced information technology research for the DoD mission; and the consequent importance of DoD's pursuit of long-term information technology research. Second, there are issues that appear elsewhere in the Federal government but with different scale and security problems. The exemplar for such issues is supply chain and logistics management. The Panel on Transforming Government recommends that the PITAC form a new panel, perhaps two, to address these issues.

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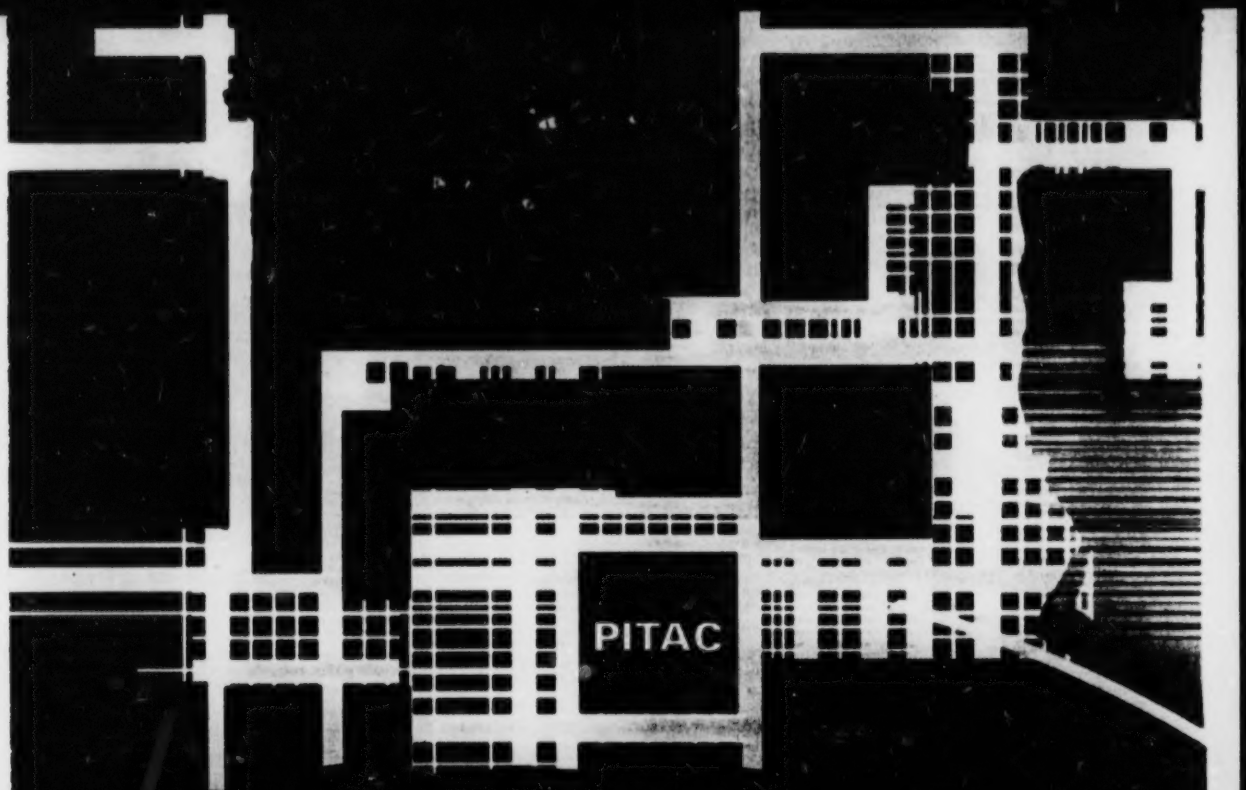

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